University of Gdańsk

Subject card

Subject name and code	Biophysics of biologically active compounds - computational exercises, PG_00153634						
Field of study	Biotechnology						
Date of commencement of studies	October 2024		Academic year of realisation of subject	2024/2025			
Education level	Master's studies		Subject group	Optional subject group			
Mode of study	full-time studies		Mode of delivery	at the university			
Year of study	1		Language of instruction	Polish			
Semester of study	2		ECTS credits	2.0			
Learning profile	academic		Assessment form	credit			
Conducting unit	Laboratory of Biophysics -> UG Institute of Biotechnology -> Intercollegiate Faculty of Biotechnology UG-MUG -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Jacek Piosik					
	Teachers	dr hab. Jacek Piosik					
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	30.0	0.0	0.0	30
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours	Self-study	SUM	
	Number of study hours	30		5.0	15.0	50	
Subject objectives	The course participant should acquire abilities that will allow him to plan and perform independently an experiment, interpret results, and also apply and exploit a suitable computational method and software. He should be able to use in practice the learnt computational techniques in various domains of biotechnology. In particular, the student will get to know: various computational techniques on the basis of linear and contour functions, ways of analyzing and interpreting spectrophotometric spectra, methods of determining association constants on the basis of existing statistical-thermodynamic models, methods of determining enthalpy of reaction, possibilities of various computational methods (Excel, Sigma Plot, MathCad). The student will acquire an ability to solve creatively and alternatively computational problems and will get acquainted with the possibilities of exploiting these abilities and competences in other domains of life.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[BIOTECHMU2_U02] The graduate is able to collect and interpret empirical data; use statistical methods and IT tools in data analysis; formulate conclusions based on empirical data	The student performs calculations based on collected experimental data. The student can interpret the results and conclude.	[SU1] oral statement/conversation/ discussion [SU8] observation of student's independent or team work
[BIOTECHMU2_W05] The graduate knows and understands the methods used in science and natural sciences necessary to understand biological phenomena and processes at the molecular level	The student knows basic and advanced methods of mathematical analysis and selected statistical-thermodynamic models.	[SW1] oral statement/ conversation/discussion [SW5] implementation of a problem task
[BIOTECHMU2_U01] The graduate is able to do laboratory work; plan and carry out an experiment; document activities and results; use complex techniques and research tools under the supervision of a tutor in laboratory work; operate laboratory equipment; apply the principles of occupational health and safety; understand the dangers of working in a laboratory	The student can plan and implement a computational research plan based on the methods learned.	[SU5] implementation of a problem task [SU8] observation of student's independent or team work

Subject contents

1.Theoretical introduction: review of applied computational programs and practical tasks with the use of these programs. Basic computational techniques. Creating and interpreting graphs. Linear and non-linear extrapolation. Analysis of errors. 2.Analysis of spectrophotometric spectra. Applying Lambert-Beer law. Determination of spectra in the form of molar extinction, isosbestic points, differences between spectra of dimerising and non-dimerising substances, colorimetric determination of concentrations of components in a mixture. 3.Dimerisation of low molecular compounds. Determining the spectrum of monomer and dimer, calculating dimerisation constant. 4. Ligand DNA interactions. Calculating interaction constant, binding site size and concentrations of particular components of a mixture. 5.Interactions of low molecular compounds. Analysis of spectrophotometric spectra of mixtures of ligands and methylxantines, spectra decomposition. Determining complex spectrum comparing methods of linear and non-linear extrapolation. Determining molar fractions. Determining components concentration. Demonstration of applying statistical-thermodynamic models of mixed association. 6. Analysis of modulation of ligand DNA interactions. Analysis of spectrophotometric spectra of mixtures, determining complex spectra, spectra decomposition. Demonstration of applying mathematical models to calculate constant interactions and concentrations of all components of reaction mixtures. 7. Basics of microcalorimetry determining the heat of reaction on the basis of thermograms of ligand titration with methylxantines. 8.Analysis of fluorescent spectra of ligands and their mixtures with DNA and low molecular compounds

Prerequisites and co-requisites

Lecture "Biophysics of biologically active compounds".

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Observation of the student's work and activity during classes.	20.0%	40.0%
Performing computational tasks.	20.0%	60.0%

Recommended reading

Basic literature	Materials prepared and provided by the instructor.
Supplementary literature	None
eResources addresses	

Example issues/ example questions/ tasks being completed

Work placement

Not applicable

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